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ABSTRACT

The program evaluated in this paper has a three-pronged design which includes two holistic strategies, Integrated Skill Development (ISD) and Thinking Across the Curriculum (TAC), in addition to the Supplemental Curriculum (SC). A pretest-posttest control group design with matching was employed. The program was conducted at the Cleveland School (Newark, New Jersey) as part of that school's experimental school plan, and was targeted for grades 5, and 7. During the 7 months of program implementation, all three teachers attained some proficiency in conducting ISD lessons and demonstrated some success in implementing at least one TAC strategy, but only a small portion of the Supplemental Curriculum was implemented. Outcome data indicated the program was more successful with seventh graders than fifth graders. In addition, there was a significant impact on language, math, and thinking skills, but not reading. While the questionable validity of the "School Attitude Measure" prevented an analysis of the program's effect on students' affective development, interview results suggest that the program may have improved students' academic self-concepts. (BW)

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An Evaluation of the Holistic Approach to Improving Thinking

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During the 1960's there was considerable experimentation in education as people imbued with the spirit of the decade promoted open classrooms, self actualization and other relatively unconventional strategies and goals. Much of this "enlightenment" ended in the 1970's as it was revealed that many students were deficient in basic academic skills. Currently, in the 1980's while the "back to basics" emphasis has resulted in some improvement in the basic skills, it is becoming apparent that students are deficient in the higher-order cognitive skills. A recent issue of Basic Education (1983) characterized this phenomenon as "the latest, biggest crisis yet".

The "glass box" theory being developed by Lauren Resnick et al. at LRDC suggests that rather than providing students with new, isolated bits of information, educators might do students a greater service by teaching them to make inferences and utilize the knowledge they already have (Schneider 1981). Within the context of Piagetian theory, the development of intellectual skills can be facilitated provided that the cognitive structures are there to be developed. There is a growing body of evidence that thinking should and can be taught.

Improving Thinking Programs

Efforts to improve thinking skills have been springing up here and in other countries. The Ontario Institute for Studies in Education (OISE) has been developing improving thinking approaches and materials for approximately a decade. Venezuela recently mounted a nationwide effort to develop the intelligence of its citizens. The Venezuelan project draws upon recent research in cognitive psychology (through Bolt, Baranek and Newman) and de Bono's CoRT program (Walsh 1981). Programs found in this country include Philosophy for Children (Lipman, Sharp and Oscanyan 1978), Instrumental Enrichment (Feuerstein 1980) and Analytical Reasoning (Whimbey and Lockhead

1980), (Vye and Bransford 1981). While all attempt to develop students' higher-order cognitive skills, these programs differ in their theoretical underpinnings and other substantial ways including: a) age of target population; b) skills developed; c) strategies to develop skills; d) relationship of program to existing curriculum, e) design of curricular components-parallel/hierarchical (de Bono, 1983); f) teacher training.

The Holistic Approach

The experimental program investigated here is a process-based approach to intelligence, based on a holistic approach to education (Hartman-Haas 1982a). The componential subtheory of Sternberg's triarchic theory of intelligence posits three types of mental processes which comprise intelligence: a metacomponent, characterized by planning, monitoring and evaluating; a performance component, defined by doing what the metacomponent decides; and a knowledge acquisition component, characterized by learning to learn (Sternberg 1983, 1984). The holistic approach to improving thinking involves training thinking skills from each of these components.

Holistic education is characterized by: a) developing individuals both cognitively and affectively; b) expanding and integrating basic skills instruction; c) implementing a multidisciplinary perspective and d) incorporating educationally relevant contexts (e.g. home) into the instructional process. Presently this program is holistic in terms of a, b, and c above. It is based on the premise that thinking is the most basic skill because it provides a foundation for the acquisition and development of the other basic skills, it underlies learning in all of the content areas, and it is central to many everyday life experiences (Hartman-Haas 1982b). The hypothesis underlying this approach is that if students are taught holistically, they will develop a differentiated, refined, elaborated and interrelated structure of

cognitive skills which will enable them to learn, retain, use and transfer their skills and knowledge better than if a discrete skills approach is used.

Table 1 shows the characteristics of the holistic thinking program.

Table 1

Holistic Approach to Improving Thinking
Program Characteristics

<u>Program Characteristic</u> age: target population	<u>Holistic Approach</u> capable of abstract thinking (grade 5 up)
skills developed	1. Integrated Skill Development (ISD): thinking, listening, remembering, reading, writing & speaking; active class participation 2. Thinking Across the Curriculum (TAC): 18 thinking skill techniques, 6 attitudes 3. Supplemental Curriculum (SC): critical thinking, clarification, logic, listening, argumentation
strategies used	1. Three-pronged program design: ISD, TAC, SC 2. Individual student cognitive strategy analysis, written/oral feedback and followup 3. Praise, recognition for good/novel ideas 4. Acceptance of good thinking which differs from teacher preconceptions/expectations 5. Class discussion and interchange 6. Modeling 7. Implementation Monitoring 8. Teacher development of instructional activities
relationship to curriculum	ISD and TAC: part of existing curriculum SC: separate curriculum
design of components	Parallel across units, hierarchical within
teacher training	Individual; once a week; 7 months - classroom as laboratory; model: instruction, implementation-observation feedback, recommendation, followup

Program Description

The program has a three-pronged design which includes two holistic strategies, Integrated Skill Development (ISD) and Thinking Across the Curriculum (TAC) in addition to the Supplemental Curriculum (SC). These three components are briefly characterized as follows:

a. Integrated Skill Development (ISD). ISD encompasses the cognitive competencies of thinking, listening, remembering, speaking, reading and writing. There are two defining characteristics of ISD. The teacher constructs tasks which require students to engage in at least four of the six skills within the context of a single lesson. Second, the teacher ensures that each student engages in each type of skill activity.

Illustrative Model

<u>Skill</u>	<u>Activity</u>
Reading	Students read chapter "Getting Equal Rights" in Scott, Foresman's <u>Social Studies</u> (1979).
Writing	Students write response to textbook exercise requiring them to tell about a time when they were discriminated against on the basis of age, height, weight, color, language or income. The task is to describe what happened, why, and how it felt at the time.
Memory	In order to perform the writing task, students must retrieve from memory information about a specific event and recall the affect surrounding that event.
Speaking	Students take turns briefly telling the class about the experience they wrote about and how they felt about it.
Listening	Students are advised to listen to each other carefully because they will have to decide which one of their peers had the most interesting experience and explain why they found it more interesting than the others.
Speaking/Writing	To ensure that each student listens, students write about or discuss the peer experience they selected.
Thinking	In order to perform the listening and follow-up tasks, students must engage in: analysis of alternatives, judgement, and decision making.

The integrated approach enables the teacher to get a lot of "cognitive mileage" out of a single lesson. Teachers are encouraged to arrange seats in a circle to facilitate discussion and promote the development of nonverbal communication skills. Teachers are asked to keep a class record of skills developed through integrated lessons in order to balance and monitor skill development.

b. Thinking Across the Curriculum (TAC). TAC is based on the premise that learning in each subject area shares many of the same intellectual skills and attitudes. This component of the program involves 18 thinking skill teaching techniques and six attitudes for teachers to develop in their students. Techniques included in TAC were compiled from theory and research in cognitive psychology; attitudes were cited by Nickerson (1981) as worth fostering to enhance thinking. Neither the techniques nor attitudes are conceptualized as definitive or comprehensive. The techniques include having students generate alternative solutions to problems and having them use multiple methods of representing information. Attitudes to be developed include an appreciation for reflection and respect for opinions different from one's own.

Teachers participate in two forms of TAC training, general TAC model alignment and specific strategy systematic implementation. In the former, the thinking techniques and attitudes provide a classroom model for training teachers. Whenever the program director observes a classroom incident which pertains to a TAC principle, the teacher is given initial feedback, specific recommendations and followup feedback. Thus the teacher's classroom behavior is aligned with the TAC model. In the latter form of training, teachers select one or two of these principles at a time and apply them systematically to each subject area during every appropriate lesson. After becoming a

natural part of the teacher's repertoire, the teacher selects one or two more and applies them systematically across the curriculum. It is expected to take two years to incorporate all TAC strategies into one's teaching.

A number of instructional methods can facilitate TAC implementation. Teachers are encouraged to: a) describe to students the desired skill/attitude, discuss and illustrate its importance and range of uses; b) model use of the skill/attitude; c) construct classroom activities which require students to use it; d) encourage students to develop and use the skill/attitude; e) praise students when they use it; and f) provide students with corrective feedback in use of the skill/attitude.

c. Supplemental Curriculum (SC). SC consists of five sections: critical thinking, clarification, logic, listening and argumentation (Hartman-Haas 1979a, b). The curriculum has a parallel design, therefore, the units are independent of each other. Although the structure of the overall curriculum is parallel, sections within the major units are organized hierarchically. Teachers are trained in the use of these materials outside the classroom.

During the first phase of the program teachers are trained in ISD and TAC, which they implement with the existing curriculum. Once the program director and teacher agree that the teacher has attained some proficiency with ISD and at least one TAC strategy the teacher can begin the second phase of the program, use of the Supplemental Curriculum. ISD and TAC training and implementation continue during phase two of the program.

Issues

Aside from having a program evaluation component, this study considers two theoretical issues regarding training intelligence and the holistic approach. Transfer of training is vital if a program is to have beneficial effects outside the narrow time and content constraints of the program. With-

in domain transfer is examined by looking at whether instruction in program thinking skills has cognitive benefits which transfer to other non-program thinking skills (verbal analogies and associative responding in this study). Vye and Bransford (op. cit.) observe that while improving thinking programs presently show improvement on problems similar to those emphasized in the program, ideally performance should change in areas not explicitly taught. The other issue considered is whether the holistic approach is more effective than the traditional, discrete skills approach in promoting thinking and achievement.

This study examines whether the holistic thinking program has a positive impact on participating students' school achievement, thinking skills and attitudes towards school beyond what occurs through the traditional instructional program alone. The author is the program developer/director and researcher/evaluator.

METHOD

Design and Sample

A pretest-posttest control group design with matching was employed. After program classes had been identified, match control classes were selected from the control school. Classes were matched on the basis of total reading scores from the Spring 1982 administration of the Metropolitan Achievement Test (MAT) (see Table 2).

Table 2
Experimental and Control Classes
Pretest Total Reading Standard Scores

Class	Experimental	Control
5A	65.06	67.70
5B (discontinued)	77.75	77.21
7A	65.00	66.69
7B	72.18	71.38

The program was conducted at Cleveland School as part of that school's experimental school plan, and was targeted for grades 5 and 7. It was assumed that students must at least be in the fifth grade in order to use the abstract materials and activities contained in the program. Classes were selected for participation by the school's principal based on her perception of teachers' openness to new instructional materials and strategies. Four classes were chosen: two fifth grades and two seventh grades. One fifth grade class (5A) was considered at the school to be a "low academic level" class and consisted of 15 students. The other fifth grade (5B) was considered a relatively "high academic level" class of 18 students. However, shortly after the program began, due to a reorganization at the school, students in this class were dispersed among the other fifth grade classes. At the seventh grade level one class (7A) had 18 relatively "low academic level" students while the other (7B) contained 17 relatively "average academic level" students. In all three classes student composition shifted throughout the year because of the high level of student mobility in the school and district. All of the students were black and of low socio-economic status families. The three teachers who implemented the program were black women who had been teaching at the school for several years (range roughly 9-19). Control students were of the same SES and ethnicity as experimental students; control teachers were also black women.

Measures

School achievement was measured by standardized tests administered through the district's regular testing program. The Metropolitan Achievement Test (May, 1982) provided pretest data; the Comprehensive Tests of Basic Skills (May 1983) provided posttest results. Both instruments assess achievement in reading, language and math. Scores from both tests were

converted to NCEs to make meaningful analyses possible.

Thinking was assessed by the Children's Associative Responding Test which measures the product and process of thinking. (The need for such measures is discussed elsewhere, Hartman-Haas 1982c). The product is measured by examining students' incorrect answers and determining the extent to which students' errors reflect the primitive strategy of associative responding. Since neither verbal analogies nor associative responding is addressed directly through the thinking program, benefits derived are assumed to accrue from transfer effects. Sternberg (op cit.) notes virtually all students of intelligence have recognized perception and solution of analogies to be fundamental to intellectual performance. The associative responding measure is interpreted as indicating a dependency upon a type of problem solving which may interfere with full utilization of reasoning ability (Achenbach 1970). The instrument was group administered to experimental and control classes by the project director/evaluator.

Affective development was assessed by the School Attitude Measure, which has the following five subscales: a) Motivation for Schooling, b) Academic Self Concept - Performance Based, c) Academic Self Concept - Reference Based, d) Students' Sense of Control over Performance, and e) Students' Instructional Mastery. This attitude measure was group administered on an experimental basis to three schools in Newark, including the experimental and control schools; the effort was coordinated by Annette Gourney. Level 4-6 was administered to fifth grade students; level 7-8 was administered to seventh graders.

Data Analysis

The degree of program implementation provided process analysis measures while analysis of covariance was performed on students' outcome data. The

pretest data were used as covariates, posttest data served as dependent variables and condition (experimental or control) was the independent variable. Comparisons were made only for students with both pre and posttest data.

Results¹

Degree of Implementation

Table 3 provides a summary of the degree of program implementation in each experimental classroom.

Class 5A. The program was implemented for approximately five months; it was interrupted in April to prepare for testing and terminated prematurely due to the teacher's absence because of an automobile accident. The teacher was observed 16 times during implementation and met with the project director on four other occasions for individual training. Although ISD was observed in four subject areas (reading, science, math and language arts), the teacher chose to emphasize it during reading. This was facilitated by the teacher's use of small group instruction. She was first observed conducting a complete ISD lesson early in December. Of the 14 lessons observed for ISD, 43 percent were complete integrated skill lessons (i.e. each student utilized at least 4 of the 6 skills).

Table 4 shows students' listening skills were utilized with the greatest frequency (100 percent of ISD lessons observed) while writing received the least attention (21 percent of ISD lessons observed). The remaining four skills (thinking, remembering, speaking and reading) were each the target of development during 86 percent of the integrated skill lessons.

¹Thanks to Joan Buttram for her feedback on an earlier version of this paper.

Table 3
Degree of Program Implementation

Variable	Program Classrooms		
	5A	7A	7B
First observation	11/17/82	11/15/82	11/16/82
Last observation	3/30/83	6/8/83	6/13/83
Total observations	16	17	22
Additional Training Meetings	4	0	7
Length of Program (months)	5	7	7
Observation date 1st complete ISD lesson	early December	early February	late November
% complete ISD lessons	43	38	48
% TAC implementation			
TAC 1	75%	75%	61%
TAC 2	75%	-	87%
TAC 3	-	-	25%
Supplemental Curriculum: Total Activities	9	0	10

Table 4
Integrated Skill Development Implementation
Percent of Lessons in Which Skill was Attended to

Class	Reading	Writing	Speaking	Listening	Thinking	Remembering
5A	86	21	86	100	86	86
7A	94	44	94	100	94	50
7B	81	38	100	95	100	43

Mean %	87	34	93	98	93	60
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Beginning in November the teacher worked on two TAC strategies. One involved requiring students to provide evidence to support conclusions and reasons to back up interpretations. Use of this strategy was observed in reading, science and math; it was employed in 75 percent of the 16 lessons observed. The other TAC strategy required students to rely on recall memory rather than recognition memory. Use was observed only in reading. It was not appropriate for the particular math or science lessons observed. Overall this strategy was used in 75 percent of the 12 lessons in which it was appropriate.

This teacher began utilizing the supplemental curricular materials in January. She implemented nine critical thinking activities which involved detecting and correcting errors in reasoning through use of logical absurdities materials (Maw and Maw 1972) and the program's specially devised four stage procedure.

In an informal evaluation of the program this teacher said her students began the school year with low self concepts but now, due the program, they seem more confident in themselves and their ability to learn. She also felt the program helped students become more active in class and thereby develop their reading and thinking skills to a greater degree than the approach she previously had been using.

Class 7A. The program was conducted for approximately 7 months in this classroom, during which time the teacher was observed 17 times. She participated in no individual training sessions independently of the regular observation/monitoring process (usually once a week). Implementation was observed in three subjects: reading, science and social studies; the latter serving as the area of concentration for program strategies. This teacher was first observed conducting a complete ISD lesson early in February; out of the 16 lessons observed for ISD, 38 percent were complete integrated skill

lessons. Students' listening skills were given the most frequent use (100 percent) while writing was focused on least often (44 percent of the ISD lessons observed). Thinking, speaking and reading were the target of development in 94 percent of the lessons; memory was focused on only 50 percent of the time.

In May the teacher began working on the TAC strategy of following up on students' ideas by probing the same student for additional thoughts on a topic. The purpose is to increase the depth and breadth of students' thinking. Use of this strategy was observed only in reading; implementation occurred in three of the four target lessons. No supplemental curricular materials were used in this classroom, however, some of these students utilized these materials and activities because the seventh grade program teachers switched some students during reading in order to group students more homogeneously. (See Class 7B for description of materials and activities).

In an informal interview about the program, conducted by Joan Buttram, the teacher indicated that the holistic approach requires more time than her usual approach to instruction. She was consequently unable to progress with curricular content as quickly as in previous years. She suggested that in the future the program should be implemented in subjects which do not have mandated amounts of unit coverage. The teacher felt the program did have some positive student impacts. Unlike in previous years, she found that all of her students participated in class discussions. In addition, she noted that her students' thinking was more ordered and that students were thinking more independently.

Class 7B. The program was conducted for seven months in this classroom. The teacher was observed 22 times and met with the program director on seven other occasions for individual training. Implementation was observed in four

subjects: reading, math, language arts and social studies. The teacher began using the program's instructional strategies when teaching reading and expanded its use into all other curriculum areas except science.

This teacher was first observed conducting a complete ISD lesson the end of November. Forty-eight percent of the lessons observed were complete integrated skill lessons. Thinking and speaking were treated with the greatest frequency (100 percent of ISD lessons observed) while writing received the least attention (38 percent of ISD lessons observed; Table 4). The remaining skills were observed at the following rates: listening = 95 percent, reading = 81 percent and remembering = 43 percent.

The 7B teacher worked on three TAC strategies. In November she began working with individual student followup to promote depth and breadth of thinking, and requiring students to produce evidence to support conclusions and reasons to support interpretations. Implementation of these two strategies was observed in reading, math and social studies. Of the lessons observed for TAC use, the former strategy was used in 61 percent while the latter was used in 87 percent. In February this teacher began working with a third TAC strategy: having students identify and examine hidden assumptions which underlie ideas and information. Use was observed in reading and social studies, in 25 percent of the 12 lessons in which its use was monitored.

In January this teacher began using the supplemental curricular materials from which she implemented ten activities. Eight involved detecting and correcting errors in reasoning through use of the logical absurdities and the specially devised procedure. In addition she implemented two activities from the clarification of thought component of the curriculum, which involved recognizing and solving problems of meaning. Some students in this class did not fully utilize these activities since the seventh grade program teachers traded students during reading.

In an interview with Buttram, this teacher indicated that the program slowed the instructional pace of the class so that the quantity of material covered was less than with the traditional instructional approach and curriculum. However, she felt that the lessons were more challenging and the quality of instruction was significantly higher because of the program. This teacher emphasized that her own teaching skills had been strengthened by the program. She learned to ask more probing questions and therefore students were forced to analyze and respond in a more complex fashion. In addition, she said students were more critical and questioning when reading textbooks and participating in classroom discussions. She noted that although students learned to be more critical, they also learned to respect the thoughts and opinions of others. Finally, she felt that all of her students became more active participants in classroom activities because of the program.

Statistical Analyses

Achievement. Pearson product-moment correlations were computed for the comparable subtests of the MAT and CTBS in order to determine the validity of conducting analyses of covariance. The results are presented in Table 5.

Table 5

Achievement Test Correlations

Subtest Content	Correlations	
	Grade 5 ^a	Grade 7 ^b
Reading Vocabulary (RV)	.39	.64
Reading Comprehension (RC)	.43	.56
Spelling (SP)	.65	.73
Total Language (TL)	.64	.37
Math Computation (MC)	.62	.59
Total Math (TM)	.41	.50

Note: ^a_n = 34-36
^b_n = 58-62

The correlations varied to some extent by subject, subskill and grade level. With two exceptions the achievement tests generally appear to be measuring the same skills. The two exceptions are fifth grade reading and seventh grade language. Therefore, caution should be exercised in interpreting the relevant findings.

Analysis of covariance results suggest that the program had no significant impact on 5th grade students' achievement, however, it did have a positive effect on language and math achievement of 7th grade students (Table 6).

Table 6
Analysis of Covariance on Achievement Test NCE Scores

Skill	Grade 5				Grade 7			
	Experi- mental	Control	F	df	Experi- mental	Control	F	df
RV	31.93	30.79	0.06	1,33	29.59	31.33	0.73	1,58
RC	37.04	31.79	3.13	1,33	34.55	34.77	0.10	1,59
SP	44.54	39.80	1.08	1,32	45.16	42.53	0.88	1,58
TL	30.20	26.65	0.92	1,33	40.02	33.17	10.06*	1,61
MC	45.70	42.09	0.35	1,31	56.96	43.13	14.90**	1,59
TM	38.13	34.09	0.81	1,43	43.91	35.95	7.30*	1,65

* $p < .01$

** $p < .001$

At the fifth grade level, after adjusting for initial differences, reading comprehension posttest means of experimental control classes were 37.04 and 31.79 respectively. Students who participated in the program scored higher than controls on their CTBS reading comprehension subtest, however, this difference was not statistically significant ($F(1,33) = 3.13, p = .086$). At the seventh grade level, reading achievement results indicate that experimental and control students did not differ in their gains in vocabulary or

comprehension.

In the area of language, fifth grade experimental students showed higher posttest scores than controls in spelling and total language, but the differences were not statistically significant. Seventh grade experimental students made significantly more improvement in total language than controls, $F(1,61)=10.06$, $p < .01$. There was no significant difference between seventh grade experimental and control students in spelling.

Fifth grade experimental students did not significantly differ from controls in their math achievement, as measured by both math computation and total math. In contrast, seventh grade experimental students showed large gains in math computation ($F(1,59)=14.90$, $p < .001$) and significant improvement in total math, $F(1,65)=7.30$, $p < .01$.

Thinking. Analyses of covariance on the two CART scores reveal there was no significant difference between fifth grade experimental and control students in the number of correct analogical reasoning items or in the degree of associative responding ("D" score, see Table 7).

Seventh grade experimental students made significantly more improvement in analogical reasoning than controls (as measured by the number of items correct) $F(1,45)=3.90$, $p < .05$ (Table 7). The means for the experimental and control students were 39.08 and 34.92 respectively. In addition, seventh grade experimental students decreased their degree of associative responding significantly more than controls (as measured by the error analysis "D" score) $F(1,45)=4.83$, $p < .05$; the means were 0.74 and 4.63 respectively.

Table 7
Children's Associative Responding Test
Analysis of Covariance Results

	Number Correct (Product: Verbal Analogies)	Difference (Process: Associative Responding)
Fifth Grade		
df	1,29	1,29
F	0.86	0.00
Means		
Experimental	27.42	4.05
Control	29.87	3.99
Seventh Grade		
df	1,45	1,45
F	3.90*	4.83*
Means		
Experimental	39.08	0.74
Control	34.92	4.63

*p < .05

Affective Development. As part of the experimental administration of the School Attitude Measure (SAM), experimental and control students' pretest data were analyzed along with the results of other students who took the SAM. Through factor analysis Gourgey (1983) found that the instrument was not valid for students in Newark. Students' responses were not consistent with the subscales. Consequently, it was determined that it would be inappropriate to re-administer the scale and use posttest results to evaluate the affective impact of the program.

Discussion

Degree of Program Implementation

During the seven months of program implementation all three teachers attained some proficiency in conducting ISD lessons. They generally found

that integrated skill lessons created a trade-off between the quantity of content covered and the quality of instruction. Nevertheless, they spontaneously decided to utilize this approach across the curriculum: to "work it through" their teaching.

Additionally, program teachers demonstrated some success in implementing at least one TAC strategy. They varied in the extent to which they utilized the strategies across the curriculum. While teachers were generally skillful in utilizing them, only a few strategies were actually implemented during the school year. Contrary to initial expectations, more than two years may be needed for teachers to integrate all TAC strategies into their teaching.

Only a small portion of the supplemental curriculum was implemented. These materials were withheld until the program director and teacher agreed that the teacher had attained a satisfactory degree of mastery with ISD and at least one TAC strategy. Two of the three teachers successfully utilized some of the materials and instructional strategies from the supplemental curriculum.

Statistical Analyses

Outcome data indicate the program was more successful with seventh grade students than fifth graders. In addition, there was a significant impact on language, math and thinking skills, but not reading. While the questionable validity of the School Attitude Measure prevented an analysis of the program's effect on students' affective development, interview results suggest that the program may have improved students' academic self concepts.

The finding that the program was more effective at the seventh grade level may, in part, be a function of a better match between the program's abstract intellectual activities and the students' level of cognitive development at the seventh grade level. However, observation and implementation data

did not reveal differences between the two grades during the year, consequently, the fifth grade achievement results were unexpected. Perhaps transfer from classroom success to test performance is easier to accomplish with seventh graders than with fifth, since some degree of abstraction is required to generalize the application of knowledge or skill from one situation (e.g. classroom learning) to another (e.g. taking a test). Seventh grade students may have had more highly developed abstraction skills than fifth graders, which may be important for consolidating and demonstrating gains from programs which emphasize the development of higher-order cognitive skills. Differences between fifth and seventh grade students' outcome analyses may also be a function of the length of time the program was implemented at the two grade levels. While seventh graders participated in the program for seven months, fifth graders participated for five months.

While the results suggest that the program showed some degree of effectiveness in developing students' skills in math, language and thinking, less impact was observed in reading. Improvement in language, math and thinking is probably, in part, a function the TAC model alignment training, including its emphasis on reflection rather than impulsiveness, attention to detail rather than vague, global awareness, and precision rather than carelessness in examining ideas and engaging in instructional activities. The teachers' use of the holistic approach (ISD and TAC) throughout much of the school day as well as use of the supplemental curricular materials most likely also contributed to student gains in these areas. It is not readily apparent why significant gains in reading failed to occur. In addition to participating in this program, some fifth grade students received drill and practice in reading comprehension on the school's computers. However, since fifth grade experimental students showed notably higher posttest scores in

reading comprehension than controls, the small sample size and only moderate correlation between pre and posttests may account for the failure to reach statistical significance at this grade level. An additional factor which applies to both grades is that reading instruction was difficult district wide because it was the first year of using a uniform basal reading series.

Results of the Children's Associative Responding Test indicate that the program improved seventh grade students' thinking skills in two ways. Students' ability to do analogical reasoning was enhanced while their reliance on the primitive strategy of associative responding was diminished. Although analogical reasoning was not a specific component of the experimental program, it was part of the students' reading program (Macmillan). The topic arose during one observation through the existing curriculum in one seventh grade class. The teacher was given feedback on the lesson and strategies for developing analogical reasoning skills, however, no further observation or followup occurred and associative responding was never discussed. Fifth graders had suffered the prolonged and disturbing absence of their teacher when the CART posttest was administered, which undermined the reliability of the results.

Implications

The improvements in achievement and thinking of seventh grade experimental students can only tentatively be attributed to the holistic thinking program because of the commonly encountered confounding factors which plague much educational research. Assuming that the program did facilitate the attainment of these educational goals, the following inferences may be drawn. Achievement results are consistent with the view of thinking as the most basic cognitive skill because the holistic thinking program enhanced the development of other basic skills. CART findings provide evidence that

higher-order intellectual skills can be developed in black, low SES urban elementary students. Additionally, CART data suggest that the thinking program resulted in within-domain transfer, based on both analogical reasoning and associative responding findings in the seventh grade. Achievement and thinking findings imply that the holistic approach (experimental) is more effective than the traditional, discrete approach (control) to instruction. Finally, grade level comparisons provide inconclusive evidence of whether the holistic thinking program may be more effectively targeted at upper than middle elementary school children.

Results of this implementation suggest future directions for classroom application and research. In terms of classroom application, from the outset teachers may be encouraged to apply ISD across the curriculum. The ISD record keeping system was too cumbersome, therefore, an alternative system for balancing skill development will have to be established. The length of time required to incorporate TAC principles into one's teaching may be revised upwards from two years. Finally, the supplemental curriculum may be introduced at an earlier phase of the program.

With regard to research, future studies should be more process oriented in order to capture the day-to-day successes and failures than can be observed in the classroom. The emphasis on studying the process of schooling as opposed to only quantifiable outcomes is consistent with John Goodlad, who said, "Studying what goes on in schools holds more promise for understanding schools (and, therefore, for being in a position to improve them) than studying what comes out of schools" (Basic Education, 1983). Longitudinal, follow up research also would be desirable for tracing the long term effects of the program's impact on students' achievement, thinking and attitudes.

In order to counter the limitation of separating the effects of the new thinking program from effects of the new reading program, the impact of the holistic approach on students' reading achievement would be assessed more validly after teachers become familiar and comfortable with materials and instructional strategies from both Macmillan and the improving thinking program.

New tests should be selected for future program implementations. An affective instrument is needed to replace the School Attitude Measure. Additional tests of thinking should be administered to assess impacts of direct instruction and transfer. Finally, the impact of the program on students' listening, speaking, writing and memory skills should also be evaluated.

Limitations

The holistic approach is a comprehensive, systematic strategy for cognitive skill development. In traditional instruction teachers focus almost exclusively on one area at a time. In contrast, ISD requires teachers to work on a minimum of four cognitive skills in one lesson. Because of the complex nature of the holistic approach, it may take longer to achieve significant gains in each of the skill areas. The current evaluation addressed only the short term effects of the program. A followup study would be necessary to examine the long term impacts of the holistic approach.

Since the program was conducted at an experimental school, some of the students were involved in more than one treatment condition. For example, some of the program students were also involved in CAI reading or math. In the current study it is impossible to separate the effects of the holistic approach to improving thinking from other programs at the school. The achievement findings for fifth grade reading and seventh grade language arts are suspect because of the moderate correlations between pre and posttest

measures. Other data anticipated did not emerge from this study. The problem of validity concerning the School Attitude Measure with these students made it impossible to document the program's effect on students' affective development. The fifth grade experimental teacher's injury and absence caused the program to be prematurely terminated and the CART to be administered under relatively adverse conditions. It is doubtful whether the fifth grade CART results are a valid test of the program's effect on fifth grade students' analogical and associative thinking.

The thinking strategies emphasized in the program are not directly measured by the instruments administered and no acceptable alternatives are known to exist (Hartman-Haas 1982c). Another issue related to the program's content concerns the rate of improvement that should be expected. The present approach is more complex than the drill-and-practice approach which characterized some of the other supplemental programs at the experimental school. The higher-order skills being developed are also more complex than the basic skills. Because of the complexities of the instructional process and content, and due to the indirect relationship between what is taught and what is measured, it is unrealistic to expect rapid growth in all areas assessed.

Conclusions

The results suggest that the holistic approach to improving thinking had a differential impact on students as a function of grade level and subject area. While students at the seventh grade level appeared to benefit from the program to a greater extent than the fifth grade students, situational factors render fifth grade findings inconclusive. A positive impact was observed in some areas of seventh grade students' achievement and thinking skills. The holistic approach also seem to be an effective strategy for increasing the

degree of students' active participation in classroom activities. The major drawback of this approach is that apparently it creates a trade-off between the quantity of content covered and the quality of instruction.

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